CLAIMS

What is claimed is:

1. A method of determining the calibration error of a metrology instrument, the method comprising:

producing initial measurements of a first reference location and a second reference location, wherein the first reference location and the second reference location are designed with different optical properties to produce different measurement results;

producing subsequent measurements of the first reference location and the second reference location;

using the initial measurements of the first reference location and the second reference location and the subsequent measurements of the first reference location and the second reference location to determine the calibration error of the metrology instrument.

2. The method of Claim 1, further comprising:

comparing the initial measurement of the first reference location and the subsequent measurement of the first reference location to obtain a measurement difference;

comparing the initial measurement of the first reference location and the initial measurement of the second reference location to obtain an initial difference; and

comparing the subsequent measurement of the first reference location and the initial measurement of the second reference location to obtain a subsequent difference;

wherein using the initial measurements of the first reference location and the second reference location and the subsequent measurements of the first reference location and the second reference location comprises using the measurement difference and the change between the initial difference and the subsequent difference to determine a calibration error of the metrology instrument.

3. The method of Claim 2, wherein the measurement difference is the calibration error when the measurement difference is greater than a first threshold and the change between the initial difference and the subsequent difference is below a second threshold.

4. The method of Claim 1, wherein the different optical properties comprise at least one of thickness, index of refraction and absorption.

5. The method of Claim 1, wherein producing initial measurements of a first reference location and a second reference location comprises measuring at least one layer on a first reference chip and measuring at least one layer on a second reference chip.

6. The method of Claim 1, wherein producing initial measurements of a first reference location and a second reference location comprises measuring a first reference location and a second reference location a reference chip.

7. A method comprising:

producing an initial measurement of at least one reference location using an ellipsometer;

producing a subsequent measurement of the at least one reference location with the ellipsometer;

using the initial measurement of the least one reference location with the subsequent measurement of the least one reference location to determine the calibration error of the ellipsometer.

8. The method of Claim 7, the method further comprising:

producing initial measurements of a first reference location and a second reference location, wherein the first reference location and the second reference location are designed to produce different measurement results;

producing subsequent measurements of the first reference location and the second reference location; and

using the initial measurements of the first reference location and the second reference location and the subsequent measurements of the first reference location and the second reference location to determine the calibration error of the ellipsometer.

9. The method of Claim 8, further comprising:

comparing the initial measurement of the first reference location and the subsequent measurement of the first reference location to obtain a measurement difference;

wherein the measurement difference is the calibration error when the measurement difference is greater than a first threshold.

10. The method of Claim 9, further comprising:

comparing the initial measurement of the first reference location and the initial measurement of the second reference location to obtain an initial difference; and

comparing the subsequent measurement of the first reference location and the initial measurement of the second reference location to obtain a subsequent difference;

wherein the measurement difference is the calibration error when the measurement difference is greater than a first threshold and the change between the initial difference and the subsequent difference is below a second threshold

11. The method of Claim 8, wherein producing an initial measurement of a first reference location and a second reference location comprises measuring at least one of the thickness, index of refraction, and absorption of at least one layer at the first reference location and measuring at least one of the thickness, index of refraction, and absorption of at least one layer at the second reference location.

12. The method of Claim 11, wherein the first reference location and the second reference location are on separate reference chips.

13. A metrology system comprising:

at least one reference location;

an ellipsometer that measures the reference location for calibration, the ellipsometer comprising:

a polarization state generator, including an electromagnetic source, the polarization state generator produces an electromagnetic beam of known polarization state that is incident on the at least one reference location during calibration;

a phase retarder in the path of the electromagnetic beam after the sample;

at least one detector that receives the electromagnetic beam after is incident on the at least one reference location;

a computer system coupled to the at least one detector; the computer system having a storage medium and a computer-usable medium having computer-readable program code embodied therein for:

producing an initial measurement of the at least one reference location and storing the initial measurement in the storage medium;

producing a subsequent measurement of the at least one reference location;

using the initial measurement of the least one reference location with the subsequent measurement of the least one reference location to determine the calibration error of the ellipsometer.

14. The metrology system of Claim 13, comprising a first reference location and a second reference location, wherein the first reference location and the second reference location are designed to produce different measurement results, the system further comprising:

means for producing relative movement between the ellipsometer and the first reference location and the second reference location relative.

15. The metrology system of Claim 14, wherein the computer-readable program code embodied therein is further for:

producing an initial measurement of a first reference location and a second reference location and storing the results;

comparing the initial measurement of the first reference location and the initial measurement of the second reference location to obtain an initial difference and storing the initial difference;

producing a subsequent measurement of the first reference location and the second reference location;

comparing the subsequent measurement of the first reference location and the initial measurement of the second reference location to obtain a subsequent difference;

comparing the initial measurement of the first reference location with the subsequent measurement of the first reference location to obtain a measurement difference; and

comparing the initial difference with the subsequent difference to obtain a reference location error;

wherein the calibration error is the measurement difference when the measurement difference is greater than a first threshold and the reference location error is below a second threshold

16. The metrology system of Claim 14, wherein the first reference location and the second reference location are on separate chips.

17. The metrology system of Claim 14, wherein the first reference location and the second reference location are on the same chip.

18. The metrology system of Claim 13, wherein the at least one reference location is in one of a vacuum, inert gas, and ambient environment.